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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/849,345	05/19/2004	Robert H. Burgener II	3398.2.9	6697
21552	7590	06/02/2005	EXAMINER	
MADSON & METCALF GATEWAY TOWER WEST SUITE 900 15 WEST SOUTH TEMPLE SALT LAKE CITY, UT 84101			TRAN, THIEN F	
			ART UNIT	PAPER NUMBER
			2811	
DATE MAILED: 06/02/2005				

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary

Application No.

10/849,345

Applicant(s)

BURGNER ET AL.

Examiner

Thien F. Tran

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 March 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3 and 5-42 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3, 5-12, 14-22, 24-35 and 37-42 is/are rejected.
- 7) ☒ Claim(s) 13, 23 and 36 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 03/17/2005.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

Claims 40 is objected to because of the following informalities: lines 2-3, "copper oxide, antimony oxide, bismuth oxide" should be --copper, antimony, bismuth-- for p-type dopants as described in the application include copper, antimony, bismuth and there is lack of support in the specification for p-type dopant materials that include copper oxide, antimony oxide and bismuth oxide (see page 5 in the application). Appropriate correction is required.

Claims 41 is objected to because of the following informalities: line 2, "copper oxide" should be --copper-- for p-type dopants as described in the application include copper, and there is lack of support in the specification for p-type dopant materials that include copper oxide (see page 5 in the application). Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3, 5-12, 14-22, 26-35, 39-42 are rejected under 35 U.S.C. 102(b) as being anticipated by White et al. (US 6,291,085).

White et al. discloses a persistent p-type zinc oxide semiconductor material that is doped with a p-type dopant selected from phosphorus, arsenic, antimony, copper, wherein the p-type dopant concentration is sufficient to inherently render the zinc oxide

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a p-type semiconductor in a single crystal form, wherein semiconductor resistivity is less about 0.5 ohm-cm, and wherein the carrier mobility is greater than about $0.1 \text{ cm}^2/\text{Vs}$.

Regarding claims 5-7, 15-17 and 28-30, the resistivity is between about 1 ohm-cm and about 10^{-4} ohm-cm that reads on the claimed range.

Regarding claims 8-9, 18-19 and 31-32, the carrier mobility is between about 0.1 and about $50 \text{ cm}^2/\text{Vs}$ that reads on the claimed range.

Regarding claims 10-12, 20-22 and 33-35, the p-type dopant concentration is in the range from about 10^{18} to 10^{21} atoms/cm³ that is in the claimed range.

Regarding claims 26 and 39, the zinc oxide is a non-stoichiometric zinc oxide compound.

Regarding claim 41, the zinc oxide is doped with p-type dopant of copper having the dopant concentration in the range from about 10^{18} to 10^{21} atoms/cm³ that is the same as the dopant concentration disclosed in the present invention. Therefore, then p-type dopant of copper inherently has a dopant concentration from about 3 to about 10 mole % as claimed.

Regarding claim 42, the zinc oxide is doped with p-type dopant of antimony having the dopant concentration in the range from about 10^{18} to 10^{21} atoms/cm³ that is the same as the dopant concentration disclosed in the present invention. Therefore, then p-type dopant of antimony inherently has a dopant concentration from about 1 to about 10 mole % as claimed.

Claim Rejections - 35 USC § 103

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The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 24-25 and 37-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over White et al. (US 6,291,085) in view of Nause et al. (US 6,887,736).

White et al. as described above does not disclose the zinc oxide further comprising cadmium and magnesium to form magnesium cadmium zinc oxide. Nause et al. recognized the need to improve the crystal quality of the film in White et al. (see col. 2, lines 30-36) by forming a magnesium cadmium and zinc oxide compound layer that has high crystal quality and also contains higher p-type dopant concentrations and possesses lower resistivity values. Therefore, it would have been obvious to form the zinc oxide layer of White et al. comprising cadmium and magnesium as taught by Nause et al. to improve the crystal quality of the ZnO film.

Allowable Subject Matter

Claims 13, 23 and 36 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thien F. Tran whose telephone number is (571) 272-

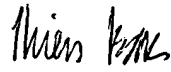
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1665. The examiner can normally be reached on 8:30AM - 5:00PM Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on (571) 272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

tt
May 30, 2005


THIENTRAN
PRIMARY EXAMINER